FINAL ENVIRONMENTAL ASSESSMENT

Proposed Translocation of Columbian White-tailed Deer from Puget Island to Ridgefield National Wildlife Refuge and Julia Butler Hansen Refuge

Julia Butler Hansen Refuge for the Columbian White-tailed Deer
Ridgefield National Wildlife Refuge

January 2014

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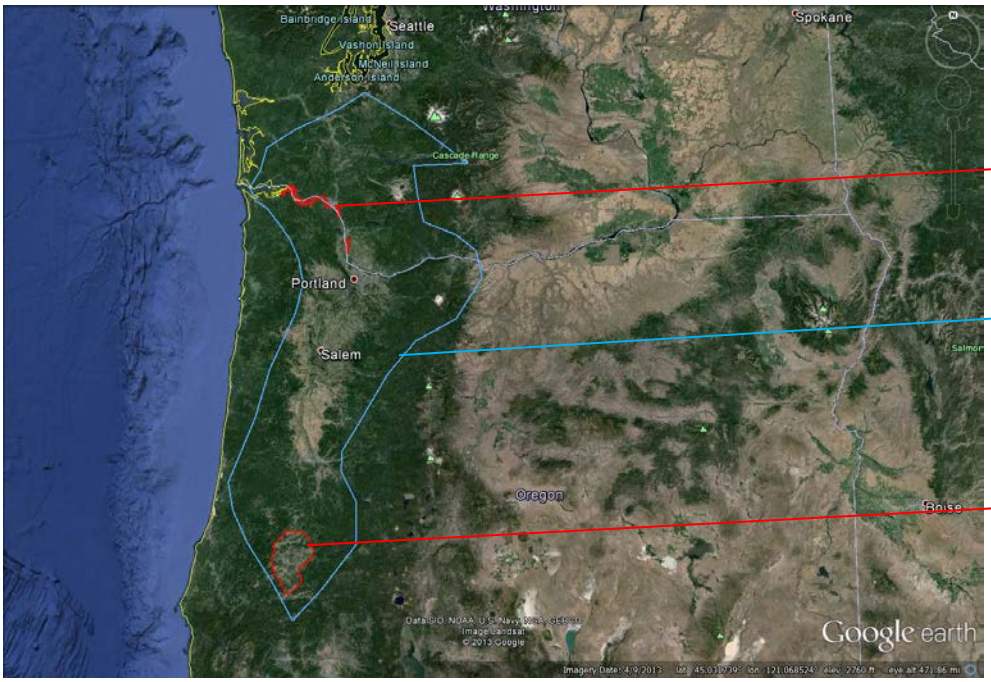
CHAPTER 1: PROPOSED ACTION

1.1 Introduction

Columbian white-tailed deer (CWTD—*Odocoileus virginianus leucurus*) exist as two Distinct Population Segments (DPS) (Figure 1). The Douglas County DPS in Oregon contains over 6,000 animals and was removed from the Endangered Species list in 2003. The Columbia River DPS occurs in the lower Columbia River floodplain in Washington and Oregon. This DPS contains about 600 animals and is listed as endangered under the Endangered Species Act (ESA). The Julia Butler Hansen Refuge for the Columbian White-tailed Deer (JBH Refuge) near Cathlamet, WA supports nearly 40 percent of the Columbia River DPS.

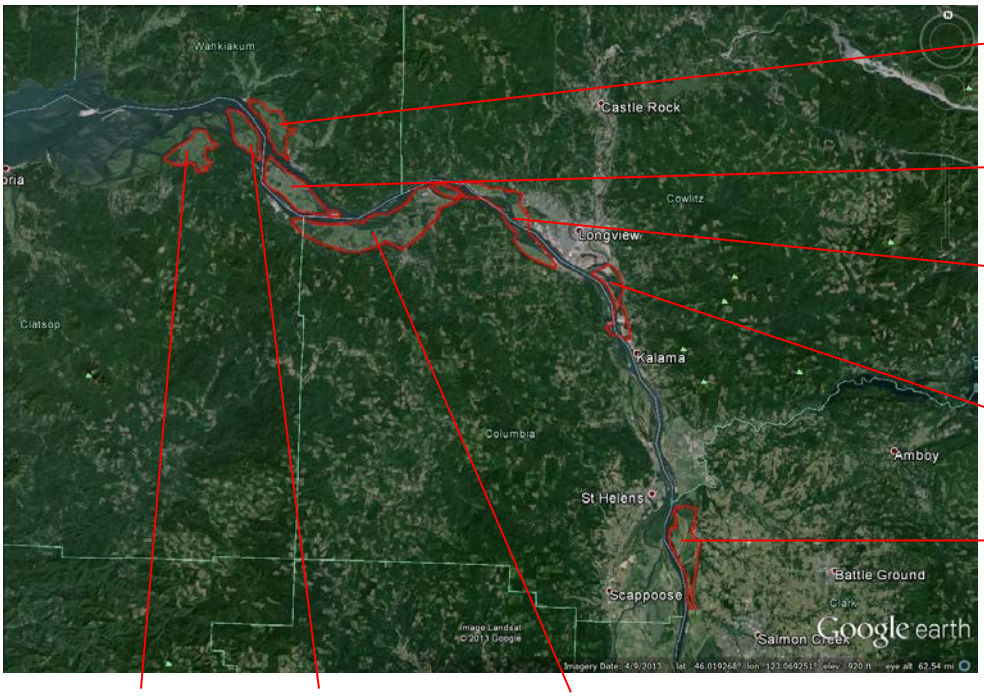
Figure 1. Current range (red) and historical range (blue) of CWTD.



Habitat for the Columbia River DPS is fragmented, and the population exists as a series of subpopulations separated by both manmade barriers (e.g., roads and other human infrastructure) and habitat barriers (e.g., rivers and coniferous forests) (Figure 2). According to recovery criteria developed for the Revised Columbian White-tailed Deer Recovery Plan (USFWS 1983), the subpopulations are considered viable and secure if they support 50 or more animals and are not under threat of development or radical change in the foreseeable future. This viable and secure designation has become an important benchmark for recovery purposes and has been used to outline delisting criteria. Currently, based upon the U.S. Fish and Wildlife Service's (Service) recent Five Year Review of CWTD (USFWS 2013[4]), two subpopulations meet the definition of viable and secure: Tenasillahe Island and Puget Island (Figure 2). Delisting requires a minimum

of three viable and secure subpopulations.

Figure 2. Current Range of the Columbia River DPS and approximate subpopulation boundaries. Two viable and secure populations exist at Puget Island and Tenasillahe Island.

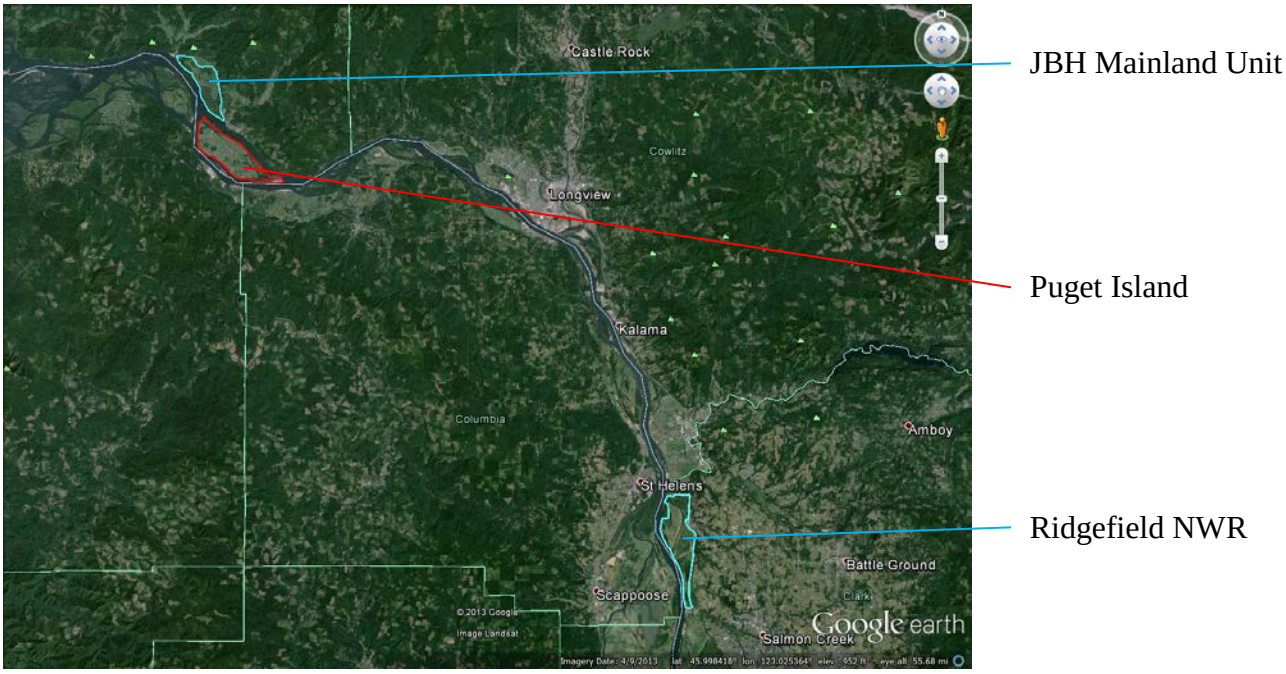


In early 2013, an emergency translocation of 37 CWTD from the JBH Mainland Unit to Ridgefield National Wildlife Refuge (Ridgefield NWR) occurred to limit the potential adverse effects that failure of Steamboat Slough Dike would have on the subpopulation (USFWS 2013[1]). The translocation created a nascent subpopulation in the Ridgefield area and temporarily reduced the subpopulation on the JBH Mainland Unit. During the summer and fall of 2013, the U.S. Army Corps of Engineers constructed a one-mile long setback dike on the JBH Mainland Unit. This construction was part of a restoration effort to reconnect a historically estuarine wetland with tidal flows of the Columbia River through levee breaching and provide access to preferred off-channel foraging and rearing habitat for juvenile salmonids (USACE 2013). Approximately 68 acres of pasture will be converted to estuary habitat when the restoration is completed during the summer of 2014. The resulting habitat changes will result in a 3% loss of CWTD feeding and cover habitat on the JBH Mainland Unit. The new setback dike provides beneficial long-term effects to CWTD by protecting both the Mainland Unit of JBH Refuge and its subpopulation of CWTD from the impacts of tidal inundation.

The Ridgefield subpopulation currently contains very low deer numbers and is unlikely to increase to a viable and sustainable population without further translocation efforts. In addition,

nearly half of the deer on the JBH Mainland Unit were removed, leaving this subpopulation with reduced numbers that are at or just below the viable designation of 50 animals. Therefore, the U.S. Fish and Wildlife Service (Service) proposes to translocate up to 35 deer in 2014 and up to 20 deer in 2015 from Puget Island, WA to the Ridgefield NWR and the JBH Mainland Unit (Figure 3). For the 2014 effort, at least 20 deer would be moved to Ridgefield NWR. The decision on which of the two sites to move the remaining 15 deer would be made after the results of JBH population surveys in February and after discussion with State and Tribal partners. In conjunction with the translocation of CWTD, the Service proposes to continue implementation of the current animal damage management (ADM) plan for landowners in both Oregon and Washington. The purpose of this Environmental Assessment is to evaluate these proposed actions.

Figure 3. Capture site (red) and release sites (blue).



1.2 Mission of the National Wildlife Refuge System

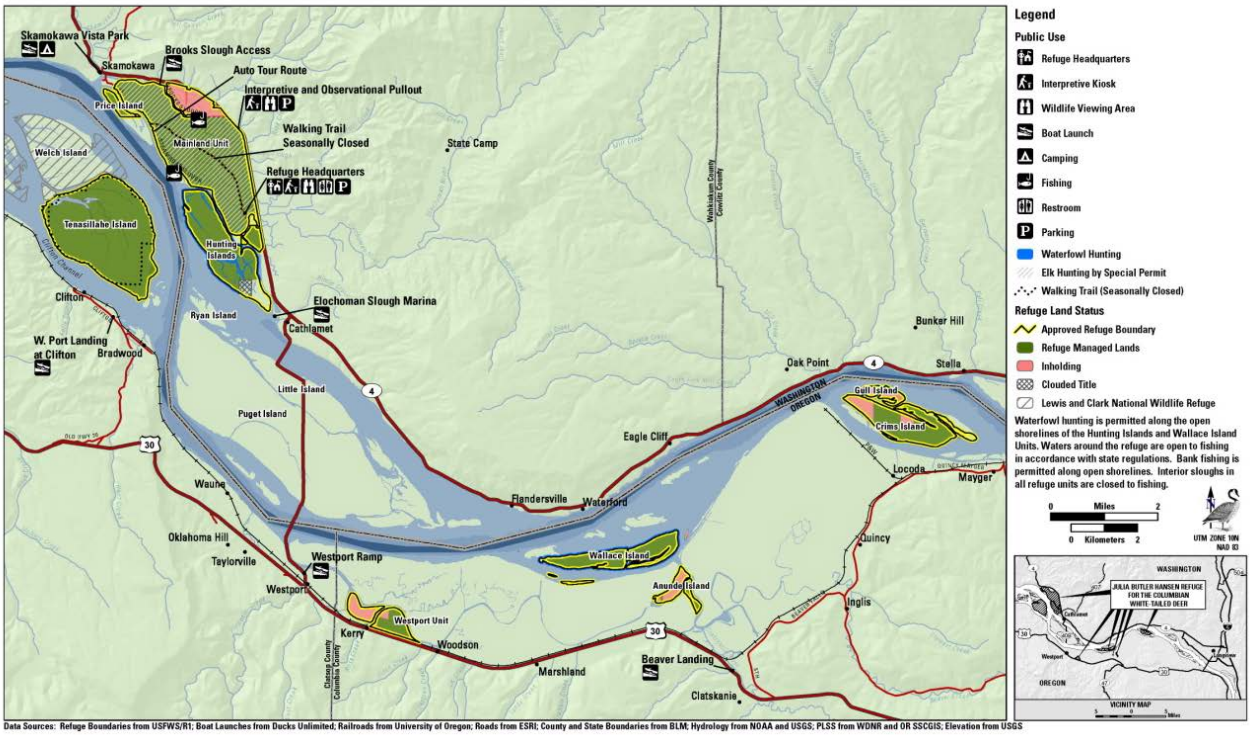
The Service established the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

1.3 Purpose and Goals of the Julia Butler Hansen Refuge

The JBH Refuge was established in 1971 to protect and manage habitat for CWTD. The Refuge

contains over 6,200 acres of fields, forested tidal swamps, brushy woodlots, marshes, and sloughs along the lower Columbia River in both Washington and Oregon. The Refuge is broken into six principal units: Mainland Unit, Hunting Islands, Price Island, Tenasillahe Island, Wallace Island and Crims Island (Figure 4). The Refuge is managed by the Service and is one of more than 560 National Wildlife Refuges in the United States.

Figure 4. Julia Butler Hansen Refuge (green) and inholdings (pink).



The goals of the JBH Refuge (USFWS 2010[1]) are as follows:

- Provide short-grass fields for the benefit of CWTD, dusky Canada geese, and other grassland-dependent wildlife.
- Restore and maintain riparian forests with diverse age and structural features characteristic of the historic lower Columbia River.
- Restore and maintain nontidal wetlands and sloughs as a mosaic with other refuge habitat types, especially riparian forest and short grass fields.
- Maintain and protect tidally influenced freshwater wetlands and swamp habitats characteristic of the historic lower Columbia River.
- Maintain a healthy, sustainable population of endangered CWTD to promote the recovery of this species.
- Provide and encourage establishment of aquatic habitat conditions that benefit salmonids and other native aquatic species of the lower Columbia River.

- Gather scientific information (inventories, monitoring, research, and studies) in support of adaptive management decisions on the Refuge.
- Provide refuge visitors with the opportunity to participate in wildlife observation, hunting, fishing, photography, interpretation, and environmental education.

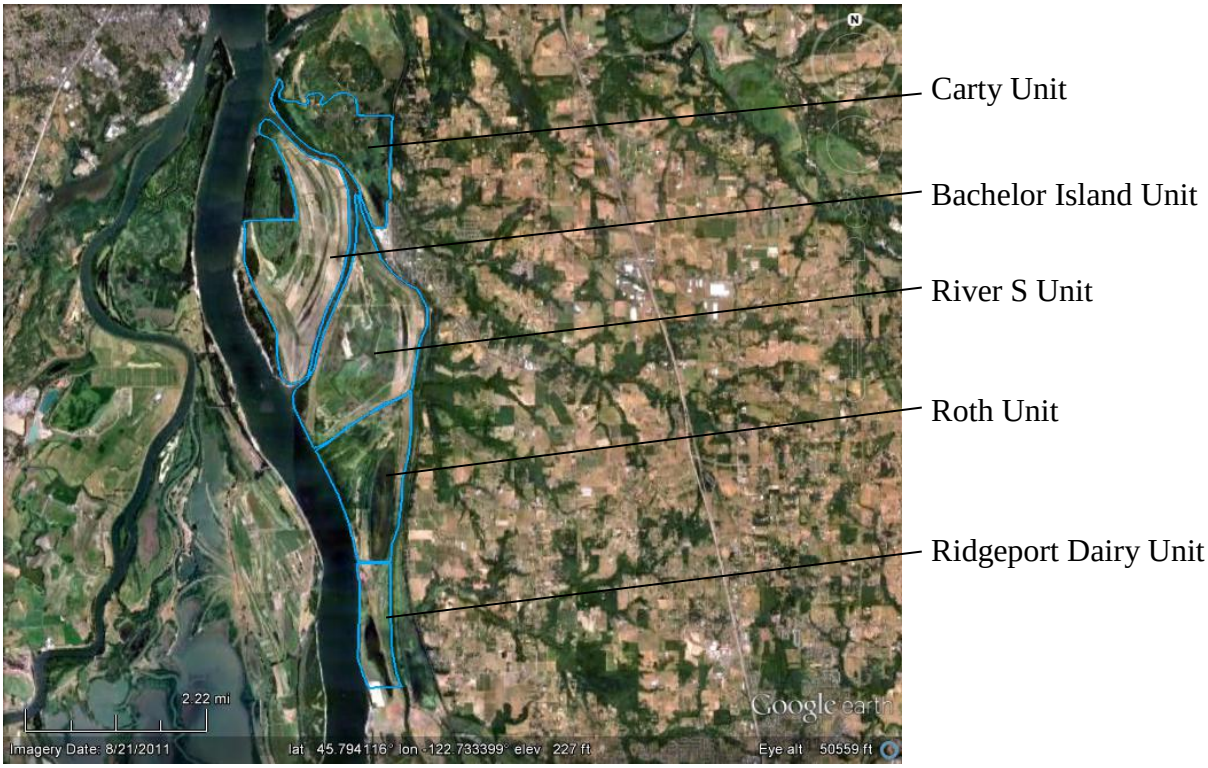
1.4 Purpose and Goals of the Ridgefield NWR

The Ridgefield NWR was established in 1965 to provide wintering habitat for dusky Canada geese and other waterfowl, provide breeding and migration use (by waterfowl), and provide substantial public shooting opportunities. While these remain the primary purposes for the refuge, as lands were acquired, purposes for those additional lands were identified as follows:

- To preclude uses that would be incompatible with wildlife use, such as industrial, commercial, or residential development, and to gain the capability to manage the land for increased wildlife benefits (Bachelor Island and Ridgeport Dairy Units, Tract 14, Roth Unit).
- To prevent major changes in the present pattern of wildlife use (Ridgeport Dairy Unit)
- For the development, advancement, management, conservation and protection of fish and wildlife resources (Fish and Wildlife Act of 1956) (Ridgeport Dairy Unit).
- To preserve a major wintering area for migratory waterfowl along the Pacific coast (Roth Unit, Tracts 14, 14a).

The refuge consists of five units (Figure 5). In addition to dusky Canada geese and other migratory waterfowl, the following species or species groups were identified as management priorities for the Bachelor Island Unit, Ridgeport Dairy Unit, and Tract 14 of the Roth Unit: bald eagle, sandhill crane, great blue heron, peregrine falcon, shorebirds, marsh birds, and songbirds.

Figure 5. Ridgefield NWR Units.



The Comprehensive Conservation Plan (CCP) for Ridgefield NWR was amended in 2013 to include the establishment and management of CWTD. The goals of the Ridgefield NWR (USFWS 2010[2], USFWS 2013[2]) are as follows:

- Provide and manage a mixture of secure, diverse, productive grassland habitats for foraging migratory waterfowl and grassland-dependent wildlife.
- Provide agricultural crops as forage for migratory waterfowl and sandhill cranes annually.
- Provide, manage, and enhance a diverse assemblage of wetland habitats characteristic of the historic lower Columbia River.
- Protect, manage, and restore a natural diversity of native floodplain forests representative of the historic lower Columbia River ecosystem.
- Protect, manage, and restore a natural diversity of native upland forests representative of the historic lower Columbia River ecosystem.
- Protect, enhance, and where feasible restore riverine habitat and tidal wetlands representative of the historic lower Columbia River ecosystem, to benefit salmonids and other native aquatic species.
- Collect scientific information (inventories, monitoring, and research) necessary to support adaptive management decisions on the refuge.

- Protect and manage cultural resources for their educational, scientific, and cultural values for the benefit of present and future generations of refuge users and communities.
- Provide waterfowl hunters of all abilities a quality, safe hunting program that provides a variety of waterfowl hunting experiences, promotes youth hunting, balances hunt program needs with other public use program needs, and reduces impacts to nontarget species.
- Provide visitors of all abilities the opportunity to participate in safe, quality wildlife-dependent recreation programs, including wildlife observation, photography, interpretation, and fishing, consistent with the needs of other public use programs, with limited wildlife disturbance in the face of increasing Refuge visitation. These programs will focus on enhancing public understanding and appreciation of wildlife and building support for the refuge.
- Provide interpretation of the refuge's cultural resources and the Cathlapotle Plankhouse to enlighten visitors about the refuge's unique natural and cultural history.
- Provide quality environmental education programs for Southwest Washington students on the refuge that meet State educational requirements and provide safe and memorable experiences that foster a connection with nature and the refuge.
- Manage and maintain a CWTD population of at least 80 animals.

1.5 Need for the Action

The Columbia River DPS of CWTD is typified by small subpopulations along the lower Columbia River valley that reflect the fragmented habitat found in this area. The goal of CWTD management is to create and maintain subpopulations that are self-sustaining and stable. This is generally interpreted to mean the creation and maintenance of subpopulations of over 50 animals in habitat where future development is not likely to adversely impact the herd.

In population management, small numbers are more difficult to regulate and are more vulnerable to random events than large populations. The size and makeup of the Columbia River DPS, which consists of multiple small subpopulations, complicates the management issues involved in the recovery process. Not only are small subpopulations at a heightened risk of adverse impacts from stochastic events, as numbers decline, predation becomes a relatively larger mortality factor that can halt population growth (Haber 1977). Many predators (such as coyotes) often limit their own numbers by maintaining large territories, while prey (such as deer) are not as bound by this density factor. When prey numbers are high, predation is a relatively smaller contribution to mortality than when prey numbers are low. In certain situations, when prey numbers are low, predation can become a limiting factor that can halt population increase or eliminate the population altogether.

Subpopulation stability is largely a balance between the number of new offspring brought into the population (fawn recruitment) and mortality factors (one of which is predation). Low fawn recruitment has been implicated in overall low population numbers for subpopulations in the Columbia River DPS, and the majority of fawn mortality is caused by coyote predation (USFWS

2008). Currently, as a result of the 2013 emergency translocation from JBH Refuge to Ridgefield NWR, there is a nascent subpopulation of deer on Ridgefield NWR and a significantly reduced subpopulation on the JBH Mainland Unit. The Service believes that both of these subpopulations require additional animals to reach stable or increasing populations.

Because a single translocation effort normally results in a small population, multiple translocations are typically necessary to bring those numbers up to the sustainable level that the habitat can support. For example, Tenasillahe Island, which maintained about 40 deer in the early 1980s, required three translocation efforts to bring the subpopulation to a new sustainable level of between 80 and 120 animals. In populations with good habitat but low numbers of deer, an effective way to build a self-sustaining population is to bring the population above the threshold where predation is limiting growth by increasing the number of deer, and/or reducing the number of predators. While predator control is already being conducted at Ridgefield NWR, recent monitoring suggests that predator control alone is unlikely to be sufficient to bring that subpopulation to a self-sustaining level, making an additional influx of deer necessary.

The Ridgefield subpopulation (including deer on Ridgefield NWR and Sauvie Island) includes 11 does and 6 bucks. Estimated fawn recruitment has averaged 35.8 fawns per 100 does for the JBH Mainland Unit over the last five years. Annual mortality for this population is estimated at 20 percent for does and 40 percent for bucks (Gavin et al. 1984). If we assume these rates for the Ridgefield subpopulation, we can expect the recruitment of four fawns and the loss of five adults, which indicates a declining population. The most effective way to change this trajectory is to increase the number of does on Ridgefield NWR. The addition of 17 does and 3 bucks would increase the subpopulation to 28 does and 9 bucks, resulting in the recruitment of 10 fawns and the loss of 9 adults. This would produce a more normal sex ratio and a stable to slightly increasing population.

While the JBH Mainland population was much reduced by the 2013 translocation, a current estimate of deer there is unavailable. However, in order to ensure a rapid return to a viable population of at least 50 deer, the Service anticipates that an input of additional deer may be necessary. A population estimate will be made in February 2014 to determine the number needed.

The CWTD recovery (delisting) criteria require a total of at least 400 animals distributed across at least three secure subpopulations that each maintains at least 50 deer (USFWS 1983). The total population of the Columbia River DPS is currently estimated at about 600 animals with two secure subpopulations (Tenasillahe and Puget Islands) of more than 50 animals each. Two additional subpopulations exist that could attain secure and viable status (Ridgefield NWR and JBH Mainland) in the near future. Translocations to both of these subpopulations would redistribute deer within current subpopulations and bring this DPS closer to reaching delisting goals.

In addition to the translocation effort, the Service, in conjunction with the states of Oregon and Washington, will continue to implement the animal damage management plan that was initiated after the 2013 translocation for landowners who may incur damage to crops or other property by

translocated CWTD or their offspring (USFWS 2013[3]).

1.6 Purpose for the Action

The Service considers the proposed action to be a recovery action that shortens the time and increases the likelihood for future recovery of the Columbia River DPS of CWTD. This action is necessary to attain population viability for the nascent subpopulation currently on Ridgefield NWR and to return the depleted population on the JBH Mainland Unit to sustainable levels. Also, the action supports the management goals of both JBH Refuge and Ridgefield NWR.

The two main recovery (delisting) criteria for this DPS listed in the CWTD recovery plan are as follows: 1) a total population of at least 400 animals, and 2) at least three subpopulations of greater than 50 animals each residing on secure habitat. The first criterion has been met, and the Service believes that additional translocations to Ridgefield NWR and the JBH Mainland will allow the DPS to meet the second criterion as well.

1.7 Decisions to be Made

Based on the analysis documented in this EA, the Regional Chief of the National Refuge System, Pacific Region, for the Service will determine which alternative to adopt and whether the selected alternative would have significant impacts on the quality of the human environment.

1.8 Public Involvement

Interested individuals, organizations, and agencies will have a 30-day comment period to review this draft EA. To facilitate public review this document will be available electronically on both Refuges' websites: www.fws.gov/jbh and www.fws.gov/ridgefield. Hardcopies of the document are also available at the locations listed in section 4.4.

Following the minimum 30-day comment period, a final EA will be prepared. Comments received will be incorporated into the final document, as appropriate. Copies of the comments will be available upon request. The decision to prepare either a Finding of No Significant Impact or an Environmental Impact Statement will be made after the final EA is completed.

CHAPTER 2. PROPOSED ALTERNATIVES

The Service considered a range of alternatives in this Environmental Assessment.

2.1 Alternatives Considered but Eliminated from Further Analysis

The following alternatives were considered but eliminated from consideration for practical or logistical reasons

Translocation of Deer to Ridgefield NWR Only—Translocating deer to Ridgefield NWR without the option of translocation to the JBH Mainland Unit was considered. This alternative was not advanced because the current population of the JBH Mainland Unit is unknown as a result of the 2013 emergency translocation. The attainment of a viable subpopulation at JBH Mainland Unit is necessary to reach both Refuge and CWTD recovery goals. An updated population estimate for the JBH Mainland Unit will not be available until translocation efforts are underway, and the option to translocate deer to JBH is necessary to react to this updated data in a timely manner.

Translocation of Deer to Other Areas—Several areas with suitable habitat within the lower Columbia River Valley exist for translocation efforts. However, such an action does not ameliorate the low population issues on Ridgefield NWR and the JBH Mainland Unit. The Service believes that building on prior translocation efforts is the most efficient way to reach recovery goals. The 5,000 acre Ridgefield NWR has one of the larger relatively undisturbed habitats along the lower Columbia River.

2.1.1 Alternatives Considered and Analyzed

The two alternatives analyzed in detail are Alternative A: No Action, and Alternative B: Translocation of animals from Puget Island to Ridgefield NWR with the option of additional translocation to the JBH Mainland Unit. The Service's preferred alternative is Alternative B.

2.1.1 Alternative A: No Action

Under Alternative A, the No Action Alternative, the Service would not translocate CWTD from Puget Island to Ridgefield NWR and the JBH Mainland Unit. It is believed that this scenario could lead to the elimination of the nascent subpopulation on Ridgefield NWR or the inability for this subpopulation to grow. Risk of inbreeding or hybridization with Columbia black-tailed deer (*Odocoileus hemionus columbianus*) would also be higher because of the small number of CWTD present. In addition, the time needed for the JBH Mainland population to return to prior sustainable levels would be extended. This action would therefore result in the increased intensity of predator control in both areas, as this activity would have to be implemented to

increase fawn recruitment until population goals were met.

2.1.2 Alternative B: Translocation of CWTD to Ridgefield NWR and the JBH Mainland Unit (Preferred Alternative)

Under Alternative B: Translocation, the Service would translocate up to 35 deer in 2014 and up to 20 deer in 2015 from Puget Island to Ridgefield NWR and the JBH Mainland Unit. Translocations would occur from January 15 to April 15, 2014 and December 15, 2014 to April 15, 2015. This timeframe is post breeding season and ensures that most does will be pregnant, thereby increasing the effective translocated population size. This also eliminates chance hybridizations that could occur if deer were moved in estrus into an area that is insufficiently populated with CWTD bucks. In addition, deer moved at this time of year tend to disperse less than those moved in fall (Hawkins and Montgomery 1969, Pais 1987, Jones et al. 1997). The Service will avoid separating fawns from their maternal parents since it is believed that moving deer outside of family groups can affect dispersal patterns. Jones et al. (1997) found that pregnant females remain closer to the release site than postparturient does released without their fawns, and Nelson and Mech (1992) suggest the possibility of social relationships influencing dispersal patterns. The number of deer transferred in 2014 to 2015 will depend on the success of the 2014 effort. It is hoped that the 2014 translocation will be sufficient to bring these subpopulations to sustainable levels, but the additional effort may be necessary to ensure the survival of the herd.

Capture and translocation would occur three to five times per week as described in the CWTD Capture Plan (USFWS, unpub. report). The Service will obtain landowner permission before trapping deer or accessing private lands. Approximately 5 to 33 percent of the deer relocated would be males and the rest would be females. The Service would employ several ground capture methods with vehicle transport. Ground capture techniques would include drop netting, drive netting, and darting. Deer would be transported in specially made crates by vehicle and boat.

Due to the smaller population size on Ridgefield NWR, the priority will be to move 20 deer to that location. Population surveys will be done in February on the JBH Mainland Unit and discussion of those results will be conducted with State and Tribal partners. The four options for the remaining 15 deer are: 1) They will be taken to JBH Mainland Unit, 2) They will be taken to Ridgefield NWR, 3) They will be split between the two areas, or 4) some portion will be deferred for translocation to JBH or Ridgefield in 2015. An additional 1020 will be moved to Ridgefield NWR in 2015.

Monitoring of the translocated deer would occur three times per week for the first month post release, at least once per week for the next six months, and two to four times per month for the remainder of the first year as described in the CWTD Monitoring Plan (USFWS, unpub. report). Monitoring will continue once per month for the next two to five years post release, funding permitted. Monitoring may be conducted by agents authorized by the USFWS Incidental Take Permit (Service, Cowlitz Indian Tribe, WDFW, and ODFW staff).

In addition to the translocation, the Service, in conjunction with the states of Oregon and Washington, will implement ADM for landowners who may incur damage to crops or other property (USFWS 2013[3]). The Service has contracted with the Animal and Plant Health Inspection Service - Wildlife Services (APHIS -WS) to respond to questions/complaints about deer damage in both Washington and Oregon and the Cowlitz Indian Tribe for questions/complaints in Washington. The designated Point of Contact (POC) for all CWTD-related inquiries is the Project Leader for Ridgefield NWR. The POC will be responsible for collecting information concerning CWTD animal damage complaints, public safety concerns related to CWTD, and sick or injured animals. This information will be provided to the designated State and Federal agencies.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Wildlife and Habitat

3.1.1 Physical Setting

Puget Island, Washington

The capture site is Puget Island, WA, which is roughly a 5,000-acre area in the lower Columbia floodplain that consists of Puget and Little Island. The island is in Wahkiakum County, WA. Economically, the island is undergoing a transition from agriculture to residential. Bureau of Census data from 2010 indicated that the county has shown a relatively stable population in residents since the 1930s: however, the population of Puget Island has contracted by seven percent since 2006. Agricultural interests mainly include cattle, sheep, and goat grazing and cottonwood plantations. The area is a mosaic of pastures, woodlots, and several-acre home sites. The island supports about 800 people. The highest density of homes runs along the southern shore with the larger, less developed and more vegetated land area toward the center of the island. Puget Island normally supports about 170 CWTD.

JBH Refuge

The JBH Refuge, located in southwestern Washington and northwestern Oregon, was established in 1971 specifically to protect and manage CWTD. The Refuge manages over 5,600 acres of pastures, forested tidal swamps, brushy woodlots, marshes, and sloughs along the Columbia River to benefit wildlife, primarily CWTD. The majority of the Refuge is comprised of several units separated by waterways: Mainland, Tenasillahe Island, Hunting Islands, Price Island, Wallace Island, and Crims Island.

The JBH Mainland Unit is comprised of about 2,000 acres of lowland habitat consisting of a mosaic of forest and meadow typified by mixed deciduous vegetation, wetlands, and invasive reed canary grass (*Phalaris arundinacea*). About 200 acres are tilled and planted with pasture grasses and forbs on a 4-year rotation. Another 600 acres are under cattle grazing through management with cooperative farmers. Grazing from April through October is used to control invasive reed canary grass and encourage the growth of understory forbs. About 50 acres of pasture are mowed each year during late summer to encourage forb growth, and another 105 acres of ephemeral wetlands are managed through water control structures. The Mainland Unit normally supports about 70 to 90 CWTD.

Historically, the Mainland Unit was estuarine habitat with daily inundation caused by back up of the Columbia River during high tides. A dike was built in the early 1900s along the Columbia and Elochoman rivers, and the area was farmed and grazed until the Refuge was established in

1971. The combination of land subsidence and increasing groundwater levels has led to increasingly wet soils and the proliferation of invasive reed canary grass.

Ridgefield NWR

The primary release sites are the Carty, Roth, River S, and Bachelor Island units of the Ridgefield NWR. The Ridgefield Refuge is located approximately 67 miles southeast of JBH Refuge in Ridgefield, Washington and is comprised of 5,218 acres of marshes, grasslands and woodlands with about 3,800 acres of terrestrial habitat. A habitat assessment suggests that Ridgefield NWR should support at least 77 CWTD (USFWS 2012[1]).

Ridgefield NWR is separated into five units (see Figure 5). The release sites were chosen because they contain the highest quality white-tailed deer habitat. The Carty Unit supports mixed deciduous habitat with oak savannah comprising a large portion of the unit. The unit contains some areas of dense to sparse invasive reed canary grass, with upland meadows supporting a variety of grasses and forbs. This unit also contains large areas of dry soils above the normal flood level. The Roth unit represents more of a parkland mosaic, with dense deciduous tree stands interspersed with upland and wetland meadows. The topography consists of fingers of forested high ground separated by swales. The three remaining units, Bachelor Island, River S, and Ridgeport Dairy, all contain large areas of low-lying meadow or seasonally-flooded wetlands with pockets of woody cover. The west end of Bachelor Island supports deciduous shrubs and forest habitat adjacent to foraging areas. The open areas in the River S and Bachelor Island units, however, mostly consist of low-lying meadows and wetlands, which represent lower quality habitat for CWTD.

The Ridgefield NWR currently manages water levels on about 1,000 acres of wetlands on the River S, Bachelor Island, and Ridgeport Dairy Unit. Water is pumped in to refuge wetlands prior to the arrival of wintering waterfowl and pumped out throughout the summer to promote the growth of desirable moist soil waterfowl food plants. The water delivery system provides water to wetlands during the winter for a variety of water birds, and is used to hold water in some units for vegetation management, rearing of ducks, wading birds, and to support native amphibians and reptiles. The refuge is managed primarily for wintering waterfowl and other migratory birds but has recently updated its management plan to include CWTD.

Cooperating farmers and Ridgefield NWR staff manage approximately 1,500 acres of grasslands and crops for wintering waterfowl. The Refuge allows cooperators to graze cattle and harvest hay between late spring and early fall; both cooperators and refuge staff mow pasture and invasive reed canary grass. These activities provide forage for Canada geese when they are on the Refuge from October to April.

Areas adjacent to the Refuge include agricultural and suburban landscapes around Ridgefield, WA and Sauvie Island, OR. The town of Ridgefield supports a population of about 5,000 people. Radiating from the urban center are residential areas transitioning into semi-rural and rural areas. Across the Columbia River from Ridgefield NWR, Sauvie Island consists of about 26,000 acres. The northern half of this island (12,000 acres) is a wildlife area managed by the

Oregon Department of Fish and Wildlife (ODFW). The southern half of the island consists of mostly rural landscape with large ownership lots and agricultural interests.

3.1.2 Wildlife and Fisheries Resources

All sites involved in the proposed translocation are in the Columbia River floodplain and share similar wildlife species. The JBH Refuge supports over 200 CWTD, including approximately 35 to 45 CWTD on the Mainland Unit. Another 400 CWTD occur on other public and private lands along the Columbia River. Puget Island is the most agricultural and suburban, and therefore supports fewer species than the refuges. The JBH Refuge and Ridgefield NWR are similar in wildlife resources.

The project areas lie on the Pacific flyway, and large numbers of birds pass through the area during migration. The area provides nesting, wintering, and migratory habitat for all bird guilds. The highest use on refuge lands and Puget Island is wintering waterfowl. Wintering waterfowl populations in the Lower Columbia area reach peaks of more than 200,000 birds. Ridgefield NWR in particular was established to provide wintering habitat for waterfowl, especially dusky Canada geese (*Branta canadensis occidentalis),* as well as State-listed sandhill cranes (*Grus canadensis*). The Columbia River flows along both refuges. In a typical year, over 750,000 adult and 100,000,000 juvenile salmonids pass through the estuary. Both adults and juveniles are present year-round, although the number of juveniles peaks in spring and early summer. There are no salmonid spawning streams within the refuges, but several fish species found in the areas around the sites are listed under the ESA and are mentioned in the following section.

While many birds, amphibians, reptiles, and mammals occur at all sites, only a small number of wildlife resources could potentially be affected by the proposed action. Bobcat *(Lynx rufus*) and coyote *(Canis latrans)* occur at all sites. Columbian black-tailed deer occur at Ridgefield NWR. A small herd of Roosevelt elk *(Cervus elaphus roosevelti)* occurs on the JBH Mainland Unit and is managed at less than 25 animals. Cottontail rabbits (*Sylvilagus floridanus*) occur on the Ridgefield NWR.

3.1.3 ESA-listed Species

Nelson's Checkermallow—Nelson's checkermallow (*Sydalcea nelsoniana)* is listed as threatened under ESA. It is a perennial plant typically found in open moist prairies or open Oregon ash woodlands. The species grows up to 5 feet tall, is shade intolerant, and does not persist in areas with a dense canopy of trees or other over-topping vegetation such as invasive reed canary grass or Himalayan blackberry. The dark red-to-purple flowers are spike-like/elongated inflorescences or clusters. Plants have either perfect flowers (male and female) or pistillate flowers (female only). The plant can also reproduce by rhizomes. Flowering typically occurs in June to early July. Seeds are mature between mid-June and mid-September.

In partnership with the Ecological Services Offices in Washington and Oregon as well as the Washington State Natural Heritage Program, nursery plugs were planted in grids in five sites at

the Ridgefield NWR. This species currently occurs at four of those sites (the Kiwa trailhead site does not support any plants). Three occupied sites are located on the Bachelor Island Unit and one site is located in Texas Island Field in the River S Unit. Threats to this species include herbivory, competition from invasive plants (i.e. Canada thistle and invasive reed canary grass) and changes in groundwater elevations related to the management of the Columbia River flows. Herbivory is most notable at the Texas Island site as it is close to a hedgerow and ash/cottonwood forest used by black-tailed deer and cottontail rabbits.

Water Howellia—Water howellia (*Howellia aquatilis)* is listed as threatened under the ESA. It is a winter annual aquatic plant that grows 4 to 24 inches high in shallow seasonally flooded water bodies associated with oxbows or geological potholes that are typically surrounded by deciduous trees. It has extensively branched, fragile submerged or floating stems and narrow, linear, alternate leaves up to 2 inches in length. Water howellia usually flowers in May and June. Flowers are white to light purple in color, and bloom near the water surface. Seeds are produced in the summer and germinate in the fall when the ponds dry. This species is known to occur in California, Idaho, Montana, and Washington and was present historically in Oregon. In the project impact area, the species occurs in four ponds within the Blackwater Island Research Natural Area in the Carty Unit of the Ridgefield NWR. Threats to this species include unsuitable water level fluctuations which could interfere with seed production or germination, excessive turbidity, and invasive plant species, specifically invasive reed canary grass.

Columbian White-tailed Deer—The CWTD population is comprised of two distinct herds that represent southern and northern fragments of the original range. The southern population occurs near Roseburg, OR in Douglas County. This portion of the herd was once listed as endangered but has since recovered to over 6,000 animals and has been delisted. The northern or lower Columbia population is considered a DPS and is listed as endangered under ESA (USFWS 1983). The current range of this DPS consists of fragmented habitat within the Columbia River floodplain from Ridgefield, WA to Brownsmead, OR. The DPS exists as a series of subpopulations separated by habitat barriers.

CWTD prefer parkland forest habitat (a mosaic of cover and meadow) and deciduous or mixed deciduous habitat with moderate cover. As they utilize both browse and forage, they thrive where moderate cover, shrubs, and meadows are present. CWTD occur on Ridgefield NWR and are common on JBH Refuge and Puget Island.

Streaked Horned Lark—The Streaked Horned Lark (STHL) is a proposed threatened species (2012 FR 61938) that nests on islands in the lower Columbia River. These birds nest in sandy areas with sparse vegetation. Most nesting sites in the lower Columbia consist of transitional habitats on dredge material sites. The closest nesting area to the JBH Mainland occurs across the Columbia River channel on Tenasillahe Island. Dredge material areas at the Ridgefield NWR are small (less than four acres) and too heavily vegetated to support STHLs.

Other ESA-listed Species—Three salmonid species have been identified in the sloughs of the JBH Mainland Unit as well as Campbell Slough at the Ridgefield NWR. These are in order of abundance: Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*Oncorhynchus*

kisutch), and chum salmon (*Oncorhynchus keta*). The lower Columbia River populations of these species are listed as threatened. Other listed species that occur in the surrounding area but not in the project areas include bull trout (*Salvelinus confluentus*), green sturgeon (*Acipenser medirostris*), Pacific Eulachon (*Thaleichthys pacificus*), and steelhead (*Oncorhynchus mykiss*). These species occur in the lower Columbia River drainage but do not occur in the project areas.

3.1.4 Effects on Wildlife and Habitat

3.1.4.1 Alternative A: No Action

Under this alternative no deer would be moved, so there would be no effects on wildlife habitat. While the effects on the overall DPS would be negligible, effects on individual subpopulations are analyzed below.

As a result of the impacts from the potential dike breach on the JBH Mainland Unit in 2012-2013, the Service conducted an emergency translocation of 37 deer from JBH Mainland Unit to the Ridgefield NWR. The JBH Mainland subpopulation was reduced by roughly half due to this emergency translocation. Alternative A would rely on this subpopulation to return to viable status on its own without an additional input of animals. This return is expected to occur but may take several years and may fluctuate until a new equilibrium is reached. Alternative A would essentially delay a return to the prior state.

Because of this delay, the No Action alternative would result in an extended timeframe for predator control on this unit. Currently predator control is used to help increase fawn recruitment. The JBH CCP outlines the criteria for implementing predator control (USFWS 2010[1]). These criteria list fawn recruitment and total deer numbers as the factors that initiate or terminate predator control. Until the unit is within 25 percent of its population goal, predator control will continue. Alternative A would increase the number of years until this population goal is reached. Therefore the number of years requiring the implementation of predator control would be extended under Alternative A. Predator control only temporarily reduces coyote numbers, and reestablishment of coyotes to their original numbers is rapid. Therefore even extended predator control would likely have only negligible effects on the overall coyote population.

Estimated fawn recruitment has averaged 35.8 fawns per 100 does for the JBH Mainland Unit over the last five years. Annual mortality for this population is estimated at 20 percent for does and 40 percent for bucks (Gavin et al. (1984). The Ridgefield subpopulation includes 11 does and 6 bucks (including deer on Ridgefield NWR and Sauvie Island). If we assume the Ridgefield subpopulation will experience reproduction trends similar to those on the JBH Mainland Unit, we can expect the recruitment of four fawns into Ridgefield's population and the loss of five adults, indicating a declining population. Therefore under the No Action alternative, we would expect the Ridgefield subpopulation to continue to decline and the Refuge would not be able to leverage this opportunity to boost the fledgling population to a healthy, self-sustaining

population. In addition, there would be a risk of inbreeding or hybridization with black-tailed deer because of the relatively small number of white-tailed deer present in the area.

As with the JBH Mainland Unit, the No Action alternative would result in the extension of the number of years that predator control is conducted as compared to Alternative B. The EA for predator control on Ridgefield specifies the continuation of control activities until population goals are met. It is expected that these goals would take longer to meet or may never be met under the No Action alternative, thereby extending the timeframe for predator control.

Puget Island wildlife populations and habitat would not be affected because no action would occur at the site.

No other wildlife or wildlife habitat would be affected by Alternative A.

3.1.4.2 Alternative B: Translocation of CWTD to Ridgefield NWR and the JBH Mainland Unit (Preferred Alternative)

Columbian White-tailed Deer—Under this alternative, up to 35 deer in 2014 and up to 20 deer in 2015 would be translocated from Puget Island to Ridgefield NWR and the JBH Mainland Unit. The number of deer in the DPS would not change; it would merely be redistributed. Therefore there would be negligible effects on the overall population of the DPS.

The Puget Island subpopulation would be reduced by up to 55 deer over two years. Currently there are approximately 170 deer on Puget Island. This represents a loss of about 20 percent of the subpopulation the first year and another 9 to 17 percent the following year. This is about the expected annual mortality rate in the first year and less than the expected rate the following year. However the net loss to the subpopulation is expected to be lower. Removal of animals from a robust population can often lower annual mortality rates and increase fecundity because of a release of competition. This is considered compensatory loss (i.e., animals will be lost naturally, so by removing a certain number; the survival of the remaining animals is increased due to lowered competition for resources). In such cases the net loss to the population would be less than the actual number of deer removed. Puget Island has been used as a source population eight times in the past 20 years. From 1985 to 1988, 80 deer were removed from Puget Island for translocations, and from 1999 to 2000, 60 deer were removed. In both cases the Puget subpopulation maintained robust population levels. The Service removed 12 deer in 2013, so an additional 55 deer would equate to a loss of 67 deer in three years. This is comparable to prior removals, and the Puget Island subpopulation would remain well above the number that is considered sustainable. The Service expects that the subpopulation would return to prior levels over the subsequent few years.

As stated in the prior section, the current Ridgefield NWR subpopulation is probably experiencing higher mortality than recruitment and is therefore slightly declining. The most effective way to change this trajectory is to increase the number of does on the Refuge. Currently there are 11 does and 6 bucks. The addition of 17 does and 3 bucks would increase the subpopulation to 28 does and 9 bucks. In this situation about 10 fawns would be recruited into

the population and about 9 adults lost. This produces a more normal sex ratio and creates a stable to slightly increasing population. Any additional animals moved would increase the stability of the subpopulation.

Alternative B allows the option to move an additional 15 deer to the JBH Mainland Unit, Ridgefield NWR, or some combination of both. The determination of the final location would be dependent on the population estimate done in February of 2014 and discussion with State and Tribal Partners. If the JBH Mainland Unit subpopulation is 50 or less, the Service would consider moving all 15 animals to JBH Refuge or defer a portion of those animals for translocation in 2015 with the goal of reaching 65 deer in 2015. If the population is between 51 and 64, a number of deer would either be moved to the JBH Mainland Unit or would be deferred for translocation to 2015, with the goal of reaching 65 animals in 2015. The remainder would go to Ridgefield NWR. If the JBH Mainland Unit contains 65 or more animals, all 15 additional deer captured on Puget Island would go to Ridgefield NWR. The general effect of Alternative B would be to return the JBH Mainland subpopulation to its natural levels more quickly than would likely occur under the No Action alternative. Ultimately, over the next five years we expect both alternatives to achieve similar results for the JBH Mainland Unit; however the rate of return would be faster under Alternative B.

Deer translocations generally lead to somewhat higher mortality than what is expected for a population that is not moved. This mortality is typically low and varies by technique, location, and year. White and Bartmann (1994) documented a 2-week mortality rate for mule deer fawns of five percent for net-gunning and 11 percent for drop-netting. This can be considered capture-related mortality as opposed to longer term overall mortality. Sullivan et al. (1991) reported a drive-netting mortality rate of 0.9 percent, compared to 23.5 percent for rocket-netting and 16.2 percent for corral trapping. DeYoung (1988) reported a mortality rate for net-gunning of 2.4 percent.

For lower Columbia CWTD captures, ground capture techniques (drop-netting, drive-netting, and darting) have averaged 4.5 percent capture-related mortality for six translocations efforts (USFWS 2012[2]). Helicopter net-gunning has averaged 12.3 percent capture-related mortality over four efforts, but two efforts have resulted in a rate of 29.8 percent (17.6 percent for all net-gunning combined).

In 2013, the Service moved 37 deer from the JBH Mainland Unit to Ridgefield NWR. Of these 37, the fates of 34 are currently known (2 uncollared deer and a deer that lost its collar are unable to be monitored). Annual mortality for this group of deer is 13 of 34, or 38 percent (Table 1). Expected annual mortality is 20% for does and 40% for bucks (Gavin 1984). This gives a combined 28 percent expected annual mortality (or an expected loss of nearly 10 deer) for the makeup of this group (23 does and 14 bucks). This suggests that 3 mortalities were due to translocation (the actual unrounded figure equals 3.4 deer or 10%). One mortality occurred in transit and the others were indirectly caused by the move (i.e., their unfamiliarity with the area increased the risk of predation). The Service anticipates mortalities to be in this range for future translocations. Predator control was implemented at Ridgefield NWR several months after translocation in 2013 and will be continued in 2014 and 2015. We expect this action to relieve

predation pressure on does and reduce total annual mortality. Furthermore, Ridgefield NWR has begun to improve the habitat for CWTD by planting additional forage and browse vegetation. We expect these improvements to continue and provide benefits to the subpopulation.

In coordination with WDFW, ODFW, Cowlitz Tribe, veterinarians, and other partners, the Service implements significant measures to ensure low injury and mortality rates during translocation. While the goal of any translocation is to have zero project-related mortality, losses to the population will be covered under a 10a1A Recovery permit. In addition, transport protocols will be altered to further reduce the chance of transport mortality.

Table 1. Mortality by type for 2013 translocation to Ridgefield NWR.

Age Class	Days to Mortality after Translocation	Mortality Type
adult	0	transport
adult	3	predation
fawn	5	unknown
adult	5	predation
adult	12	unknown
yearling	15	predation
adult	19	unknown
fawn	22	predation
adult	64	old age
adult	71	predation
yearling	101	predation
adult	170	infection
adult	240	Under Investigation

Most of the surviving deer have remained in or near the Ridgefield NWR. However, four deer have wandered far enough to no longer be considered part of the Ridgefield subpopulation. Two of these deer have moved to the Cottonwood Island subpopulation, and two deer have moved to private lands on Deer Island. While some egress is expected to occur in 2014, we hope to minimize this by releasing deer closer to the center of the refuge rather than along its borders.

Under Alternative B, the expected loss of deer due to capture-related mortality is expected to be similar to that seen in 2013—about 10% or 3 deer. This loss would not be expected to have a significant effect on the DPS. In addition, while Alternative B may improve the prospects of survival of the Ridgefield subpopulation and temporarily lower the number of deer on Puget Island, the described actions would simply redistribute deer within their current range and therefore would have negligible effects on the overall DPS.

Other ESA-listed Species—Water howellia is generally found in seasonally flooded wetlands or

water bodies on Ridgefield NWR that provide little suitable forage or cover for CWTD. Black-tailed deer occur in the vicinity and they do not appear to impact water howellia. It is possible that CWTD could cause some injury or mortality by trampling plants while wading through ponds, especially during the flowering and seed-set periods. This impact would likely be localized and uncommon. A short period of time may occur when the pond dries and the plant is still succulent that some grazing may occur. This might occur at very low intensity and would happen after seeding, and it would not be expected to affect the life cycle of the plant.

Browsing on Nelson's checkermallow by black-tailed deer was observed at the Texas Island site at Ridgefield NWR in 2012. The impacts were largely limited to the flower heads and some trampling. Deer browsing has not been observed at the other reintroduction sites, possibly because they are located in open pastures with little other forage or cover for black-tailed deer. It is possible that CWTD would occasionally browse and trample Nelson's checkermallow at the Texas Island site, as the two deer species will likely use similar habitat. However, damage to these plants is not expected to increase with the introduction of CWTD, as a certain amount of habitat partitioning will occur between CWTD and black-tailed deer, and total deer at the vegetation sites will probably be similar.

Nelson's checkermallow is a perennial plant that will reproduce from both seed and rhizomes. It can survive low levels of deer grazing (Jeff Dillon, USFWS, Portland, OR, pers. comm.) and occasional mowing. Grazing and mowing also reduce plant competition with other species, and the Refuge mows the planting sites after the plants have senesced each year. Nelson's checkermallow occurs in many areas with white-tailed deer populations, and overuse by this particular herd is not expected. The Refuge monitors the Nelson's checkermallow sites several times a year and performs annual population censuses. If deer browsing is observed and appears to be impacting the survival of the plants, the Refuge may install fences to exclude deer from the planting sites. Fencing is not currently used to allow for equipment access for annual mowing.

While STHL nesting habitat occurs adjacent to several sites on the JBH Refuge, there are no sites near the JBH Mainland, Puget Island, or Ridgefield NWR that would be affected by the translocation.

Other Species—CWTD and Columbian black-tailed deer usually have different habitat distributions, but there is overlap. With the absence of CWTD, it is thought that black-tailed deer have increased their numbers in the former CWTD range. Competition between these two species is expected to occur. The habitat at Ridgefield NWR is more appropriate for white-tailed deer. White-tailed deer are less social, however, and may tend to avoid black-tailed deer when present. Both species are expected to coexist for many years, partitioning habitat. It is hoped that the CWTD will eventually dominate the more open areas with black-tailed deer moving into areas with higher cover.

Coyotes and bobcats prey on deer fawns. Additional deer in these areas may increase the prey base for both of these species. Coyote and bobcat numbers however, are probably more influenced by small mammal and bird abundance, as this is their prey base for most of the year. In addition, because both of these species are territorial, their numbers are somewhat density

limited.

As long as the JBH Mainland Unit and Ridgefield subpopulations are below population goals, coyote control will continue to be implemented at both of these sites. While coyote control has little effect on the long-term population, Alternative B would allow these CWTD subpopulations a better chance of reaching population goals sooner, which would suspend coyote control efforts more quickly than the No Action alternative.

CWTD may represent a small amount of competition with cottontail rabbits for forbs, but this is not expected to have a significant effect on the forage base for this species. In addition the presence of deer may alleviate some predation pressure on cottontails during the fawning season. These effects are also not expected to be significant.

Few if any effects are expected on other small mammals, birds, amphibians, and reptiles.

3.2 Archaeological and Cultural Resources

The Ridgefield NWR encompasses 17 known prehistoric sites (this number includes a site on private property on Bachelor Island) and 11 historic sites (USFWS 1997). The most significant sites documented to date are the Wapato portage site and the Cathlapotle Indian Town site (45CL1) in the Refuge's Carty Unit. Aside from the Meier site (35CO5) and the Broken Tops site (35MU57), no extensive excavations of a Chinookan town have occurred below the Columbia Gorge, making Cathlapotle an important source of archaeological information about the region. It is one of the few archaeological sites on the Columbia River that has not been lost to looting, development, or flooding, and may be one of the best preserved native town sites in the northwest United States (Ames et al. 1999).

Tribal peoples in the Cathlapotle reach area include: the Chinookans, the Cowlitz, and the nearest Sahaptin "nation," the Yakama (USFWS 2011). As Federal property, stewardship of Cathlapotle and other sites on the Refuge is mandated and guided by Sections 106 and 110 of the National Historic Preservation Act (NHPA) as well as other relevant Federal cultural resource laws. As part of the stewardship program for the resource, archaeological work began at the site in 1991. A partnership between the Service, Portland State University, and the Chinook Nation soon developed, and by 1995 this partnership−the Cathlapotle Archaeological Program−was formally codified by a memorandum of agreement (MOA). Over the course of six field seasons the remains of six plankhouses, as well as thousands of artifacts, were recovered and catalogued (Ames et al. 1999).

The site occurs in forested riparian habitat of the Carty Unit, 15-20 feet above mean sea level. Covered by stands of cottonwood, willow, alder, and ash trees, with a tangled understory of elderberry and stinging nettle, the site is bounded on the west by Lake River and on the east by Long Meadow. Radiocarbon dates indicate that the town was occupied at its current location around 1450 A.D. (Lyman and Ames 2004). In comparison to the Meier Site, a larger proportion of European trade items appear to be present at Cathlapotle, suggesting that Cathlapotle was

occupied well into the historic period, while the Meier house was not (Ames et al. 1999). Serration of ceramic trade goods indicates that the Cathlapotle site was abandoned circa 1834 AD (Kaehler 2002).

Archaeologists located 11 house depressions on the surface, laid out in two rows on a ridge running parallel to Lake River. The largest of the house depressions measures 200 feet by 45 feet (10m x 63m), while the smallest is 60 feet by 30 feet. At least four are divided into compartments, as Lewis and Clark described when they visited the town in 1806 (Moulton 1991). Other features described at the site include storage pits, cobble ovens, postholes marking temporary structures such as sheds and drying racks, middens, and debris fields. Although the site was periodically flooded, it was high enough not to be subject to annual flooding, and the archaeological record indicates that it was continuously occupied.

The Wapato Portage site (45CL4) is also an important site, preserving evidence of 2,300 years of continuous occupation. None of the 14 smaller prehistoric sites have been intensively investigated. Evidence from these sites, characterized as fire hearths, habitation sites, or activity stations, suggests that these were temporary or seasonal camps established in the course of fishing, root collecting or processing, hunting, or tool manufacture.

Seven historic basalt quarry sites on the Carty Unit were placed on the National Register of Historic Places in 1981 as the “Basalt Cobblestone Quarries District.” Of the seven only one, 45CL113H, was formally recorded. The other six are grouped together, possibly under the site 45CL161H, but the Service does not have a site record which verifies this. The basalt cobbles from these seven quarries, mined from 1880 to 1903, were used for ship ballast and to pave the streets of Portland, Oregon. The quarries represent not only an important turn-of-the-century industry in Ridgefield, but also a significant step in the development of Portland from a frontier settlement to an urban and commercial center.

Historic sites 45CL112H, 45CL114H, and 45CL285H are old house sites. The 45CL286H site is a refuse dump dating to the late 19th century. Many of these sites have been subjected to looting and amateur excavation. It is very likely that other unrecorded historic (and prehistoric) sites are located on Bachelor Island under the Lake River levee. The island is significant for its early Euro-American settlement, dating to the 1850s.

The geographic setting of the Refuge--occupying both islands and mainland along the lower Columbia River--is at the heart of prehistoric and historic travel, hunting, and resource collecting routes. The Refuge is situated within the traditional domain of the Cathlamet and Wahkiakum groups of Lower Chinookan Indians. Chinookans had lived on the Columbia River for thousands of years before Euro-American explorers first arrived in the area. Settled in autonomous villages on both shores from its mouth to The Dalles, the Chinookans used the river as a highway to carry trade goods between the coast and the interior. Their strategic control over the lower Columbia made them wealthy and powerful traders.

The Wahkiakum and Cathlamet were active participants in the Euro-American trade network that evolved during the first half of the 1800s. But their numbers dwindled as warfare, liquor, and

especially introduced diseases took their toll on all the native people of the Columbia River. By the 1840s, few Chinookans remained in their traditional places on the river, and white settlers began arriving in the 1850s.

A thorough cultural resources inventory of the JBH Mainland Unit of the Refuge was conducted in 1981 (Gilbow et al. 1981). It was determined that most historical and pre-historical artifacts, if they exist, are buried several feet deep under sediment. These artifacts may include items such as remnants of native peoples' villages or boats, arrowheads and foundations of settler structures. No other cultural resources studies have been conducted in other areas of the Refuge. However, due to the movement of the river over the years, and the fact that the proposed sites are located in a flood plain, it is considered unlikely that any permanent habitations would have occurred in the action areas.

The Cowlitz Indian Tribe is a partner with federal and state wildlife management agencies working to return the once-abundant Columbian white-tailed deer to the aboriginal lands of the Cowlitz People (Cowlitz Indian Tribe, date unknown). Significant animal species for the Cowlitz Indian Tribe include elk, deer, mountain goat, salmon, eulachon, sturgeon, and lamprey, and key habitats and locations include all the rivers and fisheries, prairies, oak woodlands, berry fields and sources of obsidian, chert, or jasper (Cowlitz Indian Tribe website 2013).

As stated in the Cowlitz Tribe's proposal to establish a Cottonwood Island subpopulation of CWTD (Cowlitz Indian Tribe 2008), "The Tribe's aboriginal territory stretched from the present-day location of Bonneville Dam on the Columbia River, north to Mount Rainier, and west to the coastal foothills bordering Willapa Bay. The Tribe has an enduring cultural connection to this region, where the land and waters supported abundant natural resources in a diverse ecological setting. Unfortunately, once-teeming populations of chinook, coho, and chum salmon, steelhead trout, eulachon, and lamprey – which the Tribe relied upon for physical and spiritual sustenance – have precipitously declined. Many of these important aquatic resources are on the brink of extinction. Other important terrestrial resources are fast-disappearing; Oak woodland and anthropogenic prairie habitats that contained culturally important roots, forbs and seeds are now identified as Priority Habitats in Washington State because of their limited distribution and remnant status. The Columbian white-tailed deer, which relies heavily upon the patchy mosaic of forest-edge/woodland/prairie habitats, is also federally listed as endangered."

3.2.1 Effects on Archaeological and Cultural Resources

No cultural sites would be affected by either action. Establishment of stable populations of CWTD within their historical range represents an expansion of a cultural resource important to the Cowlitz Tribe. Black-tailed deer currently occur on Ridgefield NWR and the presence of white-tailed deer is not expected to change visitation of these sites by wildlife. Deer may occasionally wander through existing sites, but this is not expected to cause disturbance to these sites and is consistent with historical conditions. Any future ground disturbance or excavation that may be associated with the project will be reviewed by the Service's Cultural Resource Branch to protect cultural resources and ensure compliance with all applicable regulations.

3.3 Wildlife-Dependent Recreation

Ridgefield NWR has hiking trails, and auto tour route, and a free roam area. In addition, the Refuge supports a waterfowl hunt in fall. The Portland and Vancouver metro areas are within a 15 to 20 minute drive, and the Refuge receives approximately 120,000 visitors annually.

The JBH Mainland Unit is closed to public use with the exception of a walking trail that is open June 1 through September 30. State and county roads that encircle the unit and serve as a car route, but they are not managed or administered by the Refuge. Steamboat Slough Road is used by local residents, anglers fishing on the bank of the Columbia River, and refuge visitors.

Puget Island is a mosaic of individual landowners. Waterfowl hunting occurs by landowner permission and there is some use of county and state roads for wildlife viewing.

3.3.1 Effects on Wildlife-Dependent Recreation

3.3.1.1 Alternative A: No Action

There would be no change to wildlife dependent recreation on Ridgefield NWR, JBH Mainland Unit, or Puget Island under this alternative.

3.3.1.2 Alternative B: Translocation of CWTD to Ridgefield NWR and JBH Mainland Unit (Preferred Alternative)

There would be no changes in wildlife-dependent recreation on JBH Mainland Unit or Puget Island. The Carty Unit of Ridgefield NWR supports a free-roam area. Under Alternative B: Translocation of Deer, the Carty Unit would be closed during the initial translocation period to allow a settling time for the deer. The time period of release is during the lowest visitation of the year, when much of the Carty Unit is inaccessible and closure during this time is not expected to have an effect on this unit or to significantly change visitation. Other release sites are not open to the public and no changes would be made to allowable recreation at any other site. Under this alternative, deer would be more likely to be seen by wildlife viewers.

Wildlife-dependent recreation outside of the translocation areas is also not expected to be affected. Hunters have been differentiating between legal-to-hunt black-tailed deer and protected CWTD for decades. Currently there are many hunting seasons in both Washington and Oregon that require hunters to clearly identify deer species. The Service has developed outreach information to provide education on proper identification of the species for the public, including neighboring landowners, visitors to the refuge, and hunters. This education effort should further minimize the potential for accidental harvest of CWTD.

3.4 Social and Economic Environment

The JBH Mainland Unit and Puget Island are in Wahkiakum County, WA near the town of Cathlamet. Wahkiakum County is the smallest county in Washington at 261 mi^2 and 3,800 people. Cathlamet, with a population of about 600, is the only incorporated town. Managed forests occupy 80 percent of the land. Logging and commercial fishing have traditionally been the mainstays of the economy, but both have declined in recent years. Puget Island is transitioning from a rural to residential community. Tourism is becoming increasingly important. Much of the tourism is natural-resource oriented and the JBH Mainland Unit, which has abundant opportunities for viewing wildlife, is a popular attraction. Visitation to JBH Mainland Unit is estimated to be 50,000 annually.

The nearest community to Ridgefield NWR is the town of Ridgefield, WA, which adjoins the Refuge and has a population of about 5,000 people. The Refuge is located in Clark County, Washington approximately 15 miles north of Vancouver, Washington. Clark County is one of six counties included in the Portland-Vancouver/Oregon-Washington Metropolitan Statistical Area (MSA).

Clark County is growing rapidly in population (approximately 100,000), outpacing the nation in terms of both population and economic growth. Most of that growth has occurred in Battle Ground, Camas, Washougal, and Vancouver, but a significant amount has spilled over into Ridgefield. Ridgefield is currently transitioning from a rural to an urban community, and the main economic driver is as a bedroom community for the Vancouver-Portland metro area. Because of this, property values have been rising in recent years, which have caused repercussions for industries such as farming. A significant portion of the area surrounding the Refuge, however, still contains rural and agricultural landscapes.

Columbia County in Oregon is also included in this section in the event that deer move off Ridgefield NWR. The population of Columbia County is approximately 49,000 people and its population growth has been higher than Oregon's average. The nearest communities to Ridgefield NWR are St. Helens, Warren, Scappoose and Sauvie Island. Some of the primary industries of Columbia County are wood products and paper manufacturing, trade, construction, and horticulture.

The CWTD Columbia River DPS has been listed as endangered under the ESA since 1970. The Service is currently developing a proposal to downlist the DPS to threatened (USFWS 2013[4]). Some closures to hunting are presently in place where CWTD and black-tailed deer coexist due to the endangered status of CWTD. Animal damage complaints concerning CWTD occur in small numbers each year.

3.4.1 Effects on Social and Economic Environment

The social and economic effects of either alternative stem mainly from three issues: 1) the recovery status of the DPS, 2) animal damage, and 3) effects on local hunting. The CWTD Columbia River DPS was recently recommended for downlisting from endangered to threatened (USFWS 2013[4]).

3.4.1.1 Alternative A: No Action

Under Alternative A the JBH Mainland population would probably eventually recover to viable status under the criteria of the CWTD Recovery Plan. The Ridgefield population would probably decline. Under this scenario the minimum criteria for delisting would eventually be met, as three viable and secure populations would exist (JBH Mainland Unit, Tenasillahe Island, and Puget Island). This may lead to eventual delisting, but without an additional robust and secure subpopulation outside of these three to act as a buffer in case of a catastrophic event, the DPS would most likely be monitored for many years before a recommendation for delisting would be made.

The Service implemented an animal damage management plan in 2013–2014 in the event of damage to personal or commercial property. In the past year, no calls have gone out to manage animal damage issues. Under Alternative A, the Service expects little to no change in animal damage issues.

The Service, Washington Department of Fish and Wildlife, and Oregon Department of Fish and Wildlife conducted outreach to make the public aware of the presence of CWTD during hunting season. No changes were made to local hunting regulations. Each subsequent season the Service expects more awareness by hunters of the presence of CWTD in the area and no hunting closures are expected. Under Alternative A, no effects are expected on local hunting.

3.4.1.2 Alternative B: Translocation of Deer

Under Alternative B the JBH Mainland population would probably immediately recover to viable status under the criteria of the CWTD Recovery Plan. In addition, the Ridgefield population would be in a position to reach viable and secure status within a few years. Under this scenario the minimum criteria for delisting would be met and an additional viable and secure population would exist.

Delisting is likely to occur under either alternative, but it could occur much sooner under Alternative B, so long-term effects on recovery are similar between alternatives.

Some deer that are translocated to the Ridgefield NWR are expected to disperse beyond refuge boundaries. Translocated deer often spend the first few weeks exploring before settling into a home range. Some deer will probably establish home ranges on private lands surrounding

Ridgefield NWR. Of the surviving deer from the 2013 translocation, four deer settled on Sauvie Island, OR, two deer moved to Deer Island, OR, and two deer moved to the Kalama, WA area. No property damage complaints have been reported for these deer. Prior translocations to Lord and Fisher Islands resulted in ancillary populations in Longview, WA, and Rainier, OR that led to a small number of complaints from private landowners regarding damage to commercial and private property. Most complaints about deer pertain to vegetation damage of gardens, agricultural crops, and nurseries. Concern has been expressed by the state wildlife agencies and Ridgefield NWR that the increase in CWTD in this area could elicit complaints as the population expands.

Deer-related complaints in this area have mainly been the result of black-tailed deer activity. Historically, black-tailed deer densities in this area are low; however the species is ubiquitous and present throughout the urban and rural landscape of Clark County (Bender et al. 2004). Compared to the larger distribution of black-tailed deer, the translocation of 20 to 55 additional deer represents a small portion of deer in the overall environment. Due to the large amount of suitable habitat, most of these are expected to stay on the Refuge, and the ones that leave are not expected to add significantly to the current damage already being caused by black-tailed deer. ADM is normally the purview of state wildlife agencies; however the endangered status of the CWTD limits the ability of the state wildlife agencies to address damage complaints and does not permit lethal control.

To alleviate those concerns, the Service has contracted with the U.S. Department of Agriculture Animal and Plant Health Inspection Service - Wildlife Services and the Cowlitz Indian Tribe to implement an ADM plan (USFWS 2013[3]). This plan was in effect in 2013 and would be continued for the 2014-2015 translocations. In the past year, no calls to report animal damage complaints have occurred. Under Alternative B, additional animals would be moved to the Ridgefield area, which may increase the potential for animal damage issues.

The hazing and removal of deer under the ADM plan may result in a delay in alleviating the problem as compared to issuing a permit for lethal control. In a few cases this delay may lead to increased property damage. Efforts will be made to respond quickly to complaints and in cases where commercial damage is expected, to proceed immediately to capture and removal of deer in conjunction with other hazing techniques. During the course of ADM, a small number of impacts may occur through hazing or capture mortality. These activities will be evaluated and monitored by the Service through our Recovery permitting process.

The ADM plan is designed to minimize the effects of the proposed action on the social and economic environment in both Oregon and Washington. The key difference between the presence of CWTD and the presence of black-tailed deer is that lethal options are not available for CWTD. The ADM plan that would be implemented along with the proposed action would offer an alternative to lethal control and reduce the effects to the social and economic environment.

The latest recovery recommendation was to downlist the DPS from endangered to threatened status (USFWS 2013[4]). This downlisting would allow State agencies more flexibility in

managing animal damage issues. Alternative B could lead to delisting more rapidly than Alternative A. Once delisted, State agencies could have full flexibility to manage CWTD ADM issues as they would any other deer species.

The effects to black-tailed deer hunting in 2013 were minimal, and additional effects due to Alternative B are not expected in the foreseeable future. The Service, Washington Department of Fish and Wildlife, and Oregon Department of Fish and Wildlife conducted outreach to the public to make them aware of the presence of CWTD during hunting season. No changes were made in local hunting regulations. Each subsequent season the Service expects more awareness by hunters of the presence of CWTD in the area and no hunting closures are expected.

Removal of deer from Puget Island for the translocation under Alternative B would be coordinated with private landowners to target problem deer that may occur there. As such, Alternative B may have a slight social benefit for Puget Island in the form of reduced animal damage.

3.5 Cumulative Impacts

The proposed action, Alternative B, will allow the DPS to meet recovery goals sooner than Alternative A. In addition, Alternative B is expected to enhance the Ridgefield NWR subpopulation and bring it to a sustainable level. The success of the subpopulation at Ridgefield NWR and an eventual delisting could lead to a range expansion of CWTD into off-refuge landscapes. This could occur through the natural expansion of the Ridgefield NWR subpopulation, and through the lowering of barriers to translocation at off-refuge sites. Such expansion represents a return to the historic range, but also may lead to human/animal interaction in areas away from the release sites.

Currently black-tailed deer occur in nearly all areas that CWTD may eventually occupy. As CWTD expand, it is expected that a certain level of habitat partitioning will occur, and that black-tailed deer will be replaced in their marginal habitats that are more suited to CWTD. Both species are expected to represent about the same level of human/animal interaction, and as such, there is no expectation of an increased cumulative impact. The range expansion is of note because as long as CWTD are listed as endangered, it is more difficult to control damage issues because lethal control options are not available. In lieu of lethal control, hazing and nonlethal removal would be used while the deer are still listed as endangered. As the DPS goes through downlisting and delisting, we would expect few differences in ADM between black-tailed deer and CWTD.

An eventual delisting would also lead to reduced regulation of the DPS, allowing State agencies more flexibility in managing animal damage issues. It is likely that areas currently closed to black-tailed deer hunting because of the presence of CWTD would be opened. While hunting of CWTD would probably remain prohibited for some time after delisting, white-tailed deer could eventually become a legal game species in the lower Columbia River Valley, with a regulated hunt managed by State agencies.

The Service expects this DPS to be delisted under either alternative; however the delisting could occur sooner under Alternative B. As such, regulatory issues for the public and state agencies would be reduced sooner under Alternative B.

3.6 Comparison of the Alternatives and Rationale for the Preferred Alternative

Under Alternative A: No Action, the Service would not conduct deer translocation efforts. The JBH subpopulation would probably eventually return to secure and viable status after a few years, and the DPS would eventually reach minimum criteria for delisting. The Ridgefield subpopulation would either remain small or decline, leaving it at increased risk of inbreeding, local extinction, or hybridization with black-tailed deer. This alternative would also maintain the need for predator control at both JBH Mainland Unit and Ridgefield NWR until population goals are met.

Under Alternative B: Translocation of Deer, the Service would conduct deer translocations January 15–April 15, 2014 and December 15, 2014–April 15, 2015. The initial translocation would move at least 20 deer to Ridgefield NWR and an additional 15 deer in some combination to either the JBH Mainland Unit or Ridgefield NWR. Following an assessment of the Ridgefield subpopulation through fall of 2014, an additional 10–20 deer would be moved to Ridgefield NWR if necessary in winter 2014–2015. This action would quickly return the JBH Mainland subpopulation back to viable and secure status, and position the Ridgefield subpopulation to reach viable and secure status within a few years. The DPS would reach delisting criteria sooner under Alternative B than under Alternative A and would be in a more robust position for delisting. This action would also relieve stressors on the Ridgefield subpopulation, such as increased risk of inbreeding and hybridization, and the threat of a declining subpopulation. Shortening the time to reach population goals would decrease the number of years that predator control is needed at both JBH Mainland Unit and Ridgefield NWR and would shorten the period of regulatory restrictions on animal damage management and hunting.

In addition Alternative B would contribute to the goals of the National Wildlife Refuge System by strengthening the Service's ability to provide wildlife conservation, contribute to protecting endangered species in the Refuge System, and provide additional opportunities for wildlife viewing.

CHAPTER 4. COORDINATION, CONSULTATION, AND COMPLIANCE

4.1 Agency Coordination and Public Involvement

Technical coordination on alternatives has been conducted among Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, the Cowlitz Indian Tribe, Ecological Services, Ridgefield NWR, and JBH Refuge**.** Meetings and monthly conference calls with all of these partners have been conducted prior to this review. Outreach to landowners surrounding Ridgefield NWR has occurred and will continue. The Refuges have also contacted elected officials at the county and federal levels. Public information meetings about the emergency translocation were held on January 22, 2013 in Ridgefield, Washington and January 23, 2013 in Sauvie Island, OR. Outreach efforts in both Washington and Oregon have continued throughout 2013 and are expected to continue.

4.2 Environmental Review and Coordination

In conducting a translocation effort, the Service would comply with Federal laws, regulations, and executive orders. The following section describes how the proposed action is in compliance with the National Environmental Policy Act; Endangered Species Act; National Historic Preservation Act; Comprehensive Environmental Response, Compensation, and Liability; and other relevant Federal executive orders.

4.2.1 National Environmental Policy Act

As a Federal agency, the Service must comply with provisions of the 1969 National Environmental Policy Act, as amended (42 U.S.C. 4321-4347). An environmental analysis is required under NEPA to evaluate reasonable alternatives to meet a specified purpose and need for action. An environmental assessment serves as the basis for determining whether implementation of the proposed action would constitute a major Federal action significantly affecting the quality of the human environment. The planning process for developing the environmental assessment facilitates the involvement of government agencies and the public.

In this EA, the Service evaluated two alternatives to meet the Service's purpose and need to maintain the status of CWTD: Alternative A—No Action, and Alternative B—Translocation of Deer. Alternative B would involve the translocation of deer to the JBH Mainland Unit and Ridgefield NWR to supplement the populations there.

4.2.2 Endangered Species Act

A section 7 consultation will be completed to determine effects of the translocation on threatened and endangered species.

4.2.3 National Historic Preservation Act

The Service would follow established procedures for protecting archaeological and cultural resources if encountered during the translocation process. The Service would avoid damaging cultural and historic resources and would comply with the National Historic Preservation Act of 1966 (16 U.S.C. 469) and other cultural resource preservation laws, and consult with the State Historic Preservation Office and appropriate Native American tribes for any future restoration and management actions which may have the potential to affect historic properties or cultural resources.

4.2.4 Comprehensive Environmental Response, Compensation, and Liability Act

Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 U.S.C. 9601 et seq.), the Service determined that the proposed project areas are not on the Environmental Protection Agency's National Priority List or in their CERCLA System.

4.2.5 Executive Order 12372. Intergovernmental Review

Coordination and consultation with affected Tribal, local and State governments, other Federal agencies, and local interested persons has been completed through personal contact by Refuge staff, and Refuge Supervisors.

4.2.6 Executive Order 13186. Responsibilities of Federal Agencies to Protect Migratory Birds.

This Order directs departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act. A provision of the Order directs Federal agencies to consider the impacts of their activities, especially in reference to birds on the Fish and Wildlife Service's list of Birds of Conservation (Management) Concern . It also directs agencies to incorporate conservation recommendations and objectives in the North American Waterbird Conservation Plan and bird conservation plans developed by Partners in Flight into agency planning. The effects of all alternatives to Refuge habitats used by migratory birds were assessed within the EA.

4.2.7 Other Federal Executive Orders

In implementing the proposed action, the Service would comply with the following Executive Orders: Protection of Historical, Archaeological, and Scientific Properties (Executive Order 11593); Management and General Public Use of the National Wildlife Refuge System (Executive Order 12996); Departmental Policy on Environmental Justice (Executive Order

3127); and Consultation and Coordination with Indian Tribal Governments (Executive Order 13175).

4.3 Tribal Consultation

USFWS Secretarial order #3206: American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act

The JBH Refuge 2010 CCP includes Tribal Consultation in section 2.3.11, reading: "Tribal Coordination: Coordination with Native American Tribes that have an interest in the refuges will occur. We will coordinate and consult with the Cowlitz Tribe and the Shoalwater Bay Tribe regarding issues of shared interest. The Service may expand and seek assistance from other Tribes for future issues related to cultural resources education and interpretation, special programs, the NHPA, and the Native American Graves Protection and Repatriation Act.

The Ridgefield NWR 2010 CCP includes Tribal consultation in section 2.3.1, reading "Tribal coordination. The Service will coordinate and consult with the Cowlitz Tribe and the Chinook Tribe on a regular basis regarding issues of shared interest. Other Tribes with interests relating to the traditionally shared resource corridors along the lower Columbia River will also be included in consultations affecting those resources. Local Tribes include the Confederated Tribes of the Grande Ronde, the Shoalwater Bay Tribe, the Confederated Tribes of Warm Springs, and the Yakama Tribe. Currently, the Service seeks assistance from Tribes on issues related to cultural resources education and interpretation, special programs, and the National Historic Preservation Act (NHPA)" Cowlitz Tribal representatives did participate in the development of the Ridgefield NWR CCP, dated 2010, and endorsed the idea that Ridgefield NWR was suitable habitat and destination for translocation of CWTD.

The Cowlitz Tribe's MOA with the Ridgefield NWR (dated 2004) ensures " ... equal participation in the development, planning, and production of educational and interpretive materials relevant to the presence of Cowlitz Indians in the area of the refuge, where supported by historical and archaeological evidence ... " As CWTD are a significant cultural resource to the Cowlitz Tribe, the novel presence of CWTD on Ridgefield NWR lands should provide excellent opportunities for the Cowlitz Tribe to assist with the development of outreach materials

4.4 Distribution and Availability

A press release was sent to media outlets near both refuges (in both Washington and Oregon) announcing the availability of the Draft EA.

Copies of the EA are available on both Refuges' websites: www.fws.gov/jbh and www.fws.gov/ridgefield. Hardcopies of the document are also available at the following locations:

Julia Butler Hansen Refuge for the Columbian White-tailed Deer
46 Steamboat Slough Road
Cathlamet, WA 98612
360/795-3915

Willapa National Wildlife Refuge
3888 SR101
Ilwaco, WA 98624
360/484-3482

Ridgefield National Wildlife Refuge
28908 NW Main Avenue
Ridgefield, WA 98642
360/887-4106

CHAPTER 5. REFERENCES

Ames, K.M., C.M. Smith, W.L. Cornett, S.C. Hamilton, E.A. Sobel, S.C. Hamilton, J. Wolf and D. Raetz. 1999. Archaeological Investigations at 45CL1 Cathlapotle (1991–1998), Ridgefield Wildlife Refuge, Clark County, Washington; A Preliminary Report. Cultural Resource Series Number 13. Fish and Wildlife Service, Portland, OR. Wapato Valley Archaeological Project Report #7, Portland State University, Portland, OR.

Bender, L.C, J.C. Lewis, and D.P. Anderson. 2004. Population ecology of Columbian black-tailed deer in urban Vancouver, Washington. Northwestern Naturalist, 85(2):53-59. 2004.

Cowlitz Indian Tribe. 2013. Website: http://www.cowlitz.org/index.php/natural-resources-mission-statement

Cowlitz Indian Tribe. 2008. Proposal to establish a Cottonwood Island subpopulation of Columbian White-Tailed Deer. 17 pp.

Cowlitz Indian Tribe. Date Unknown. The Relationship of the Cowlitz People with Columbian White-tailed Deer (Odocoileus virginianus ssp. leucurus). 6pp.

DeYoung, C.A. 1988. Comparison of net-gun and drive-net capture for white-tailed deer. Wildl. Soc. Bull., 16(3):318-320.

Gavin, T.A., L.H. Suring, P.A. Vohs, Jr., and E.C. Meslow. 1984. Population characteristics, spatial organization, and natural mortality in the Columbian white-tailed deer. Wildlife Monographs 19, 3-41.

Gilbow, D., G.W. Lindeman, and H.S. Rice. 1981. Cultural Resources Overview and Intensive Survey of the Columbia White-tailed Deer National Wildlife, Wahkiakum County, WA, and Clatsop County, OR. Eastern Washington University Reports in Archaeology and History, Cheney, WA. Prepared for U.S. Fish and Wildlife Service.

Haber, G.C. 1977. Socio-ecological dynamics of wolves and prey in a subarctic ecosystem. Ph.D. dissertation, University of British Columbia, Vancouver, Canada. 786 pp.

Hawkins, R.E and G.G. Montgomery. 1969. Movements of translocated deer as determined by telemetry. J. Wildl. Manage. 33:196-203.

Jones, M.L, Mathews N.E., and W.F. Porter. 1997. Influence of Social Organization on Dispersal and Survival of Translocated Female White-Tailed Deer. Wildlife Society Bulletin, 25:272-278.

Kaehler, G.A. 2002. Patterns in glass: the interpretation of European glass trade beads from two protohistoric sites in the greater Lower Columbia region. Portland State University, Portland, OR.

Lyman, R.L. and K.M. Ames. 2004. Sampling to redundancy in zoo archaeology: lessons from the Portland Basin, northwestern Oregon and southwestern Washington. Journal of Ethnobiology 24(2) 329–346.

Moulton, G.E., ed. 1991. The Journals of the Lewis and Clark Expedition, Vol. 7, March 23 to June 9, 1806. University of Nebraska Press, Lincoln, NB.

Nelson, M.E. and L.D. Mech. 1992. Dispersal in Female White-Tailed Deer. Journal of Mammalogy, Vol. 73, No. 4 (Nov., 1992), pp. 891-894.

Pais, R.C. 1987. Mortality, dispersal and habitat use of resident and translocated white-tailed deer does on the Cumberland Plateau of eastern Kentucky. M.S. Thesis. Univ. Kentucky, Lexington. 82pp. As quoted in Jones et al. 1997.

Sullivan, J.B., C.A. DeYoung, S.L. Beasom, J.R. Heffelfinger, S.P. Coughlin, and M.W. Hellickson. 1991. Drive-netting deer: incidence of mortality. Wildl. Soc. Bull., 19(4):393-396.

USACE. 2013. Julia Butler Hansen Refuge for the Columbian White- Tailed Deer Steamboat Slough Restoration Environmental Assessment. Portland, OR. 77pp.

USFWS. 1983. Revised Columbian white-tailed deer recovery plan. U.S. Fish and Wildlife Service, Olympia, WA.

USFWS. 1997. Summary of Cultural Resources, Ridgefield NWR. Nov 21, 1997. Unpublished report on file at U.S. Fish and Wildlife Service, Sherwood, OR.

USFWS. 2008. Factors affecting fawn survival of Columbian white-tailed deer in the lower Columbia River. U.S. Fish and Wildlife Service, Julia Butler Hansen Refuge for Columbian White-tailed Deer, Cathlamet, WA. 11pp.

USFWS. 2010[1]. Lewis and Clark National Wildlife Refuge and Julia Butler Hansen Refuge for the Columbian White-tailed Deer Comprehensive Conservation Plan and Environmental Impact Statement. U.S. Fish and Wildlife Service, Willapa National Wildlife Refuge Complex, Ilwaco, WA. 505 pp.

USFWS. 2010[2]. Ridgefield National Wildlife Refuge Comprehensive Conservation Plan. U.S. Fish and Wildlife Service, Ridgefield National Wildlife Refuge, Ridgefield, WA. 701 pp.

USFWS 2011. Cathlapotle and Its Inhabitants, 1792-1860: A Report Prepared for the U.S. Fish

and Wildlife Service, Region 1, by Robert Boyd. U.S. Fish & Wildlife Svc. 2011. 209p. iIIus. maps. SuDoc# 149.111:15.

USFWS. 2012[1]. Habitat suitability of Ridgefield NWR for Columbian White-tailed deer. USFWS report. Julia Butler Hansen Refuge for Columbian White-tailed Deer, Willapa National Wildlife Refuge Complex, Cathlamet, WA. 4 pp.

USFWS. 2012[2]. Report of activities for Columbian white-tailed deer, recovery sub-permit WNWR-9 calendar year 2012. USFWS report. Julia Butler Hansen Refuge for Columbian White-tailed Deer, Willapa National Wildlife Refuge Complex, Cathlamet, WA. 9 pp.

USFWS. 2013[1]. Columbian White-Tailed Deer Translocation Final Environmental Assessment: Proposed Translocation of Deer from the Julia Butler Hansen Refuge for the Columbian White-tailed Deer and Puget Island to Ridgefield National Wildlife Refuge and Cottonwood Island. Willapa National Wildlife Refuge Complex, Ilwaco, WA. 37pp.

USFWS. 2013[2]. Ridgefield National Wildlife Refuge Comprehensive Conservation Plan Amendment: Post-Translocation Management of Columbian White-tailed Deer at Ridgefield NWR and Environmental Assessment. Ridgefield NWR, Clark County, WA, April 2013.

USFWS. 2013[3]. Animal Damage Management Plan for Columbian White-tailed deer in the Columbia River Distinct Population Segment of Washington and Oregon. Willapa National Wildlife Refuge Complex, Ilwaco, WA. 33pp.

USFWS. 2013[4]. Columbia River Distinct Population Segment of the Columbian White-tailed Deer (*Odocoileus virginianus leucurus*) 5-Year Review: Summary and Evaluation Columbian White-Tailed Deer. Washington Fish and Wildlife Office. Lacey, Washington. November 2013.

White G.C. and R.M. Bartmann. 1994. Drop nets versus helicopter net guns for capturing mule deer fawns. Wildl. Soc. Bull. 22:248-252.